Improving Drought Monitoring and Forecast Operation at CPC
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1. Introduction

Drought is a leading natural disaster for the United States.
- Recent droughts caused more than 10 Billion economic and property damages.
- Losses of crops and livestock during the 2011 Texas drought caused 7.6 billion dollars .
- The Texas drought also exposed the vulnerability of the electricity generation
- Improve monitoring and prediction of drought in near real time can lead to better planning and to reduce the damages caused by drought .
- The projects from the Climate Test bed improve the ability of CPC to monitor and predict drought on seasonal time scales.
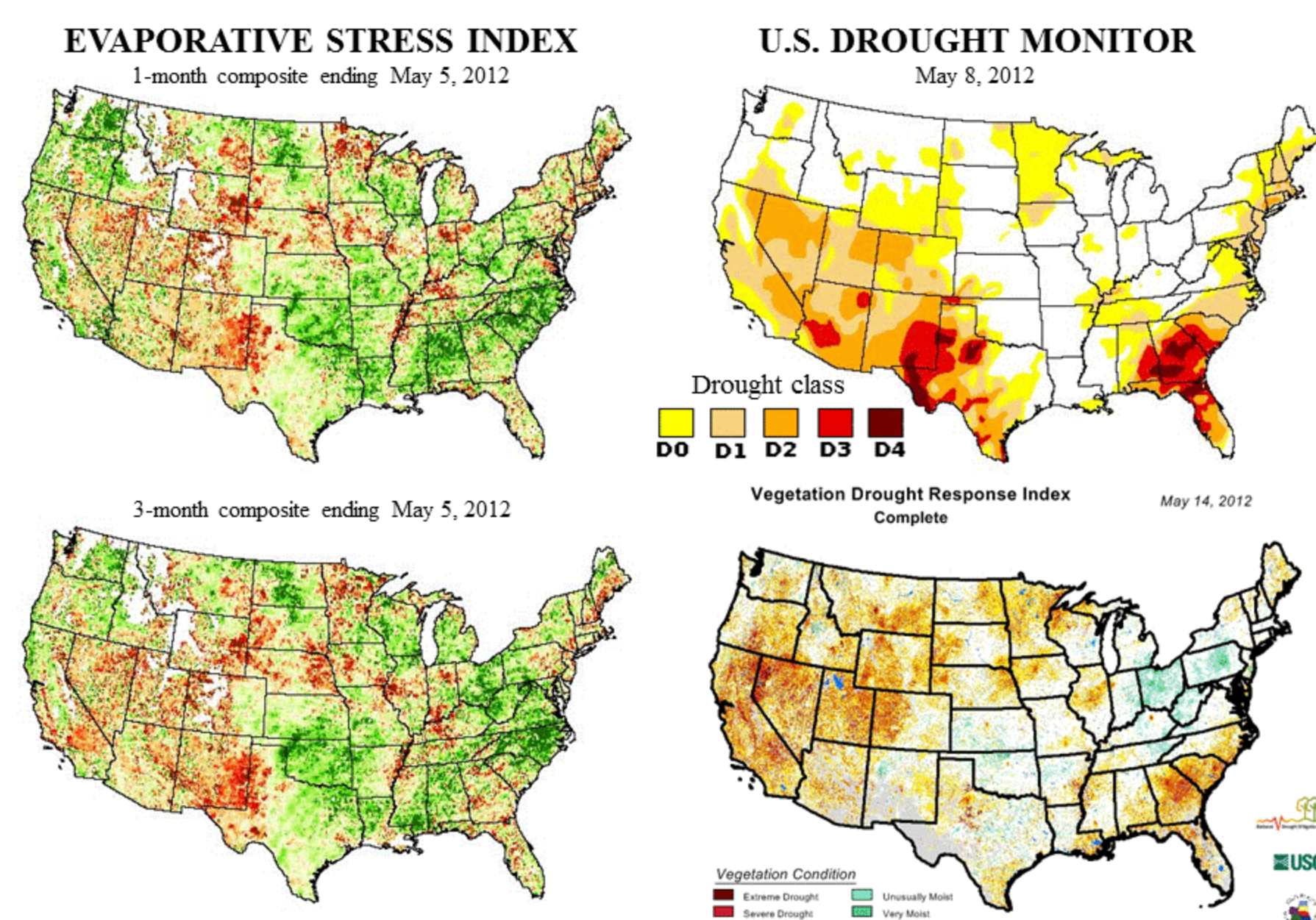
Project 1 : The evaporative Stress Index for drought monitoring
(PI: Martha Anderson , USDA)

We developed the Evaporative Stress Index (ESI) for monitoring.
It is a satellite derived index developed within a thermal remote sensing energy balance framework .
Advantages:
1. Independent on land models
2. Sensitive to vegetation and is good to monitor quick drought onset
3. Compares well with the U. S. Drought Monitor and the North American Data Assimilation System

Comparison between ensemble mean soil moisture percentiles from the NCEP NLDAS, UW NLDAS and ESI at the peak of the 2012 July drought
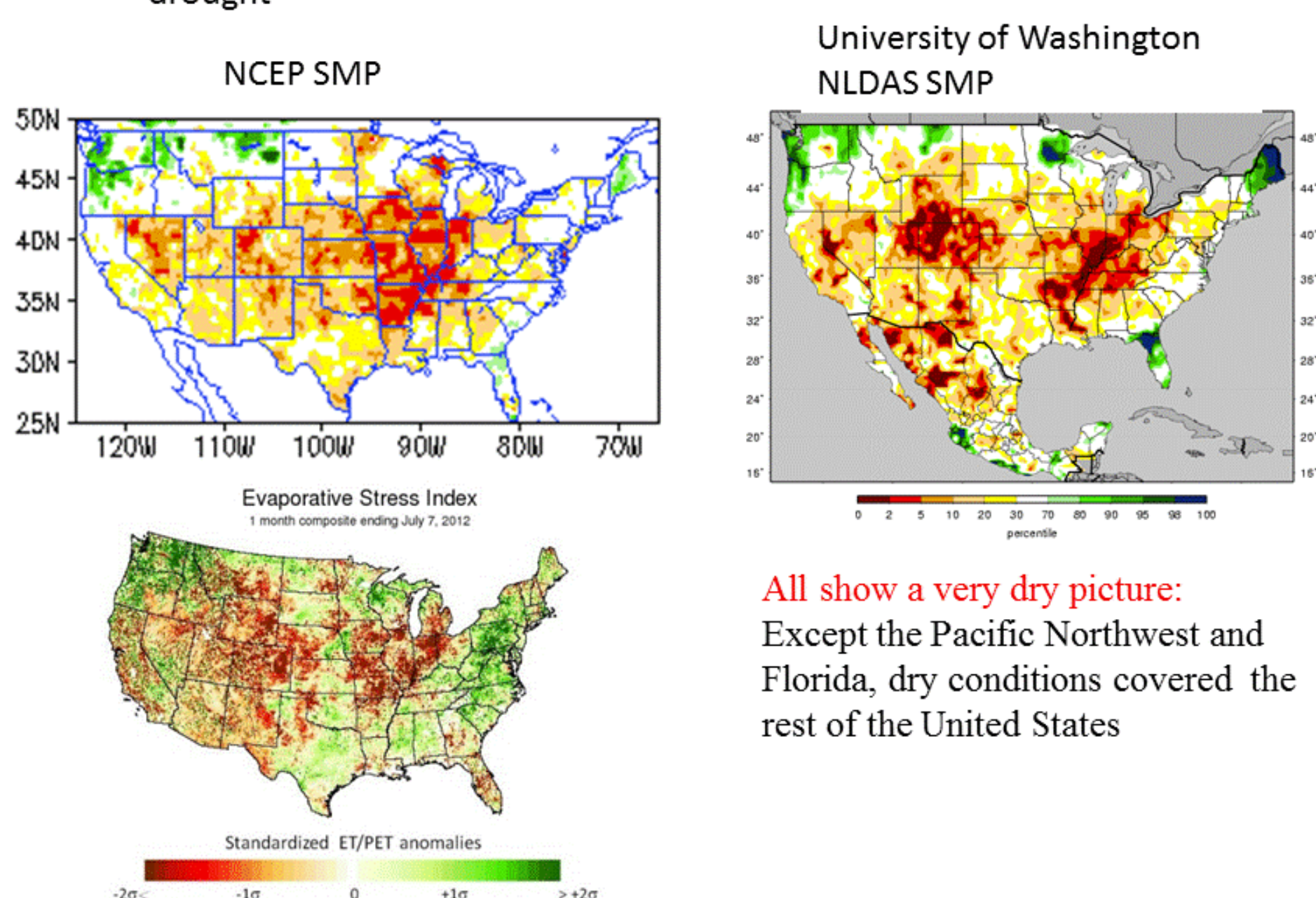

All show a very dry picture:
Except the Pacific Northwest and Florida, dry conditions covered the rest of the United States

Project 2: Standardized Precipitation Index seasonal Multi Model Ensemble forecasts
(PIs: Eric Wood Princeton University; Brad Lyons IRI)

1. Standardized Precipitation Index (SPI) is the index used to monitor the meteorological drought which measures the shortage of precipitation.
2. Multi model ensemble of six models: CFSv2, GFDL, NCAR, NASA and two Canadian models has been used for seasonal forecasts of monthly mean precipitation
3. Monthly mean precipitation forecasts are used to forecast the 6-month SPI (SPI6) out to 6 months and 3-month SPI(SPI3) out to 3 months
4. It gives forecasts the indication of drought development in the next 3 months.

SPI Fcst Ics Jan 2013
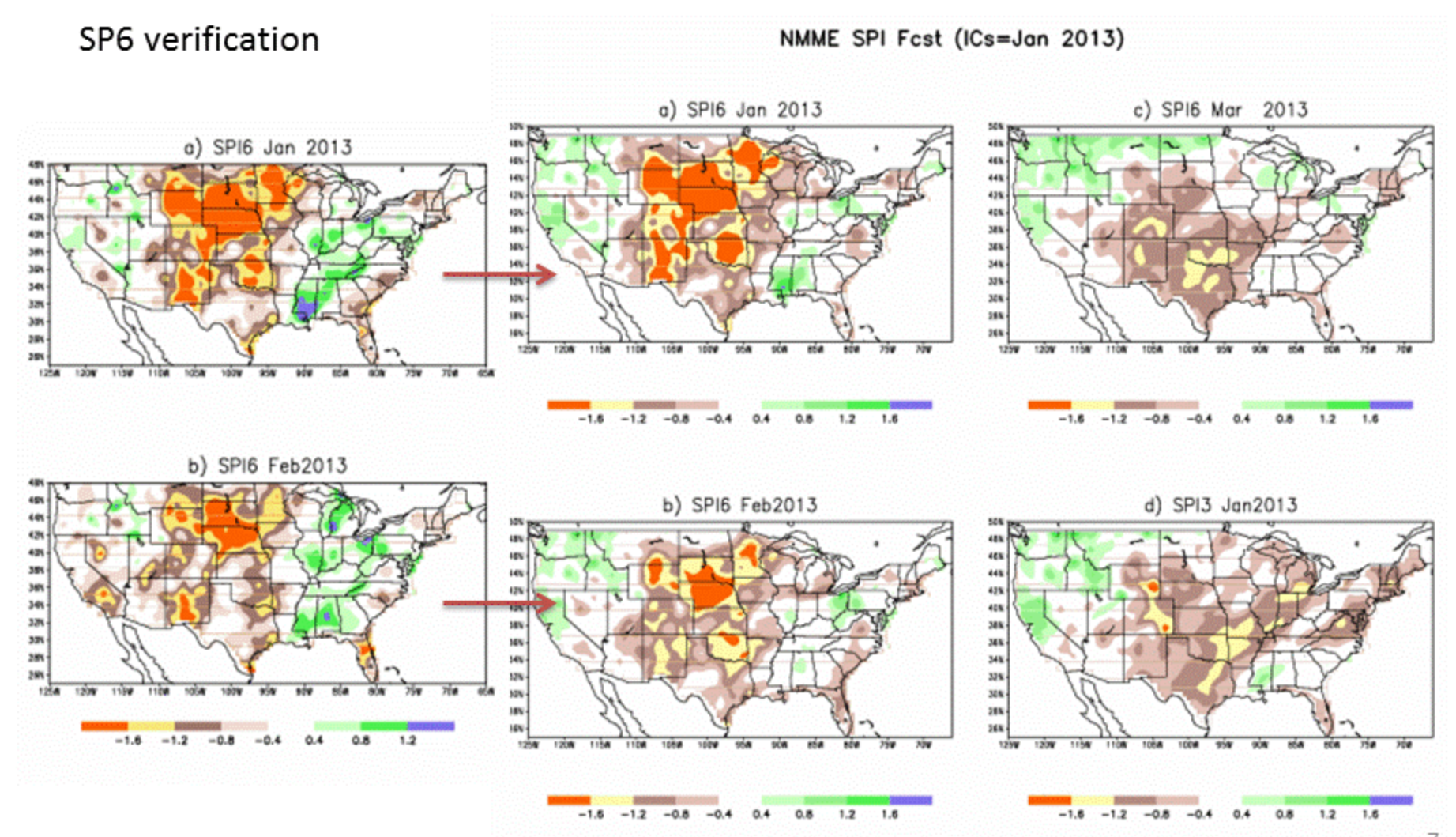
Project 3: Development of drought probabilistic forecasts with
Dennis Lettenmaier, University of Washington

1. SM and runoff for monitoring are derived from the North American Data Assimilation system (NLDAS) which have large uncertainties
2. While all indices are able to detect the same drought event and capture its evolution, differences are often too large to classify drought into D0 to D4 categories.
3. We propose to use a probabilistic approach to address the uncertainties of drought classification.
4. The grand ensemble mean of 6-month SPI (SPI6), SMP and 3-month SRI(SRI3) from different NLDAS systems is used for drought classification
5. The uncertainties of the grand mean index are assessed by using the drought concurrence measure defined as the percentage of indices in each drought category (D0 to D4)

Probabilistic drought classification
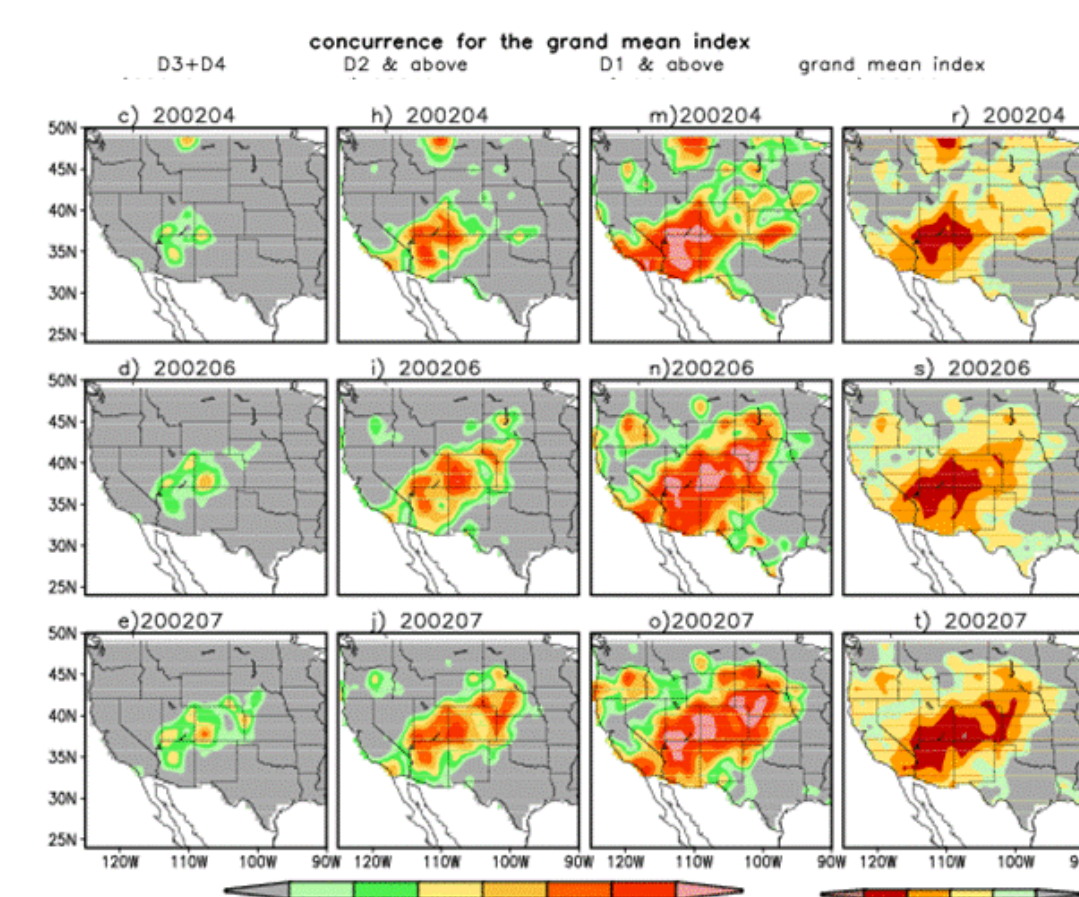
1. At the peak of drought in 2002 summer, the concurrence measure of the drought occurrence indicates that there is a 40-50% prob for drought in the D3/D4 category.
2. There is still a 20-30% chance for the drought in the D2 category